5-5-3-4

THE ANNUAL CHARGE AGAINST TREATED TIMBER

PROTEXOL CORPORATION

SUCCESSOR TO

CARBOLINEUM WOOD PRESERVING CO.

11 BARCLAY ST. NEW YORK, U.S.A.

Confidence is a plant of slow growth. It may breed prematurely in the hot, stifling air of flattery and deception, but it will live and endure only in the invigorating almosphere of sincerily.

BULLETIN 40

THE ANNUAL CHARGE AGAINST TREATED TIMBER

BY E. F. PADDOCK, CHEMICAL ENGINEER

Protexol
WOOD PRESERVATIVE

PRESERVES WOOD EVERYWHERE

PREVENTS ROT AND DECAY ANYWHERE

ERRATA

Bulletin 40—Protexol Corporation, New York

Page 7, last table should read as follows: $a=c\left[\frac{r}{(1+r)^n-1}+r\right]$

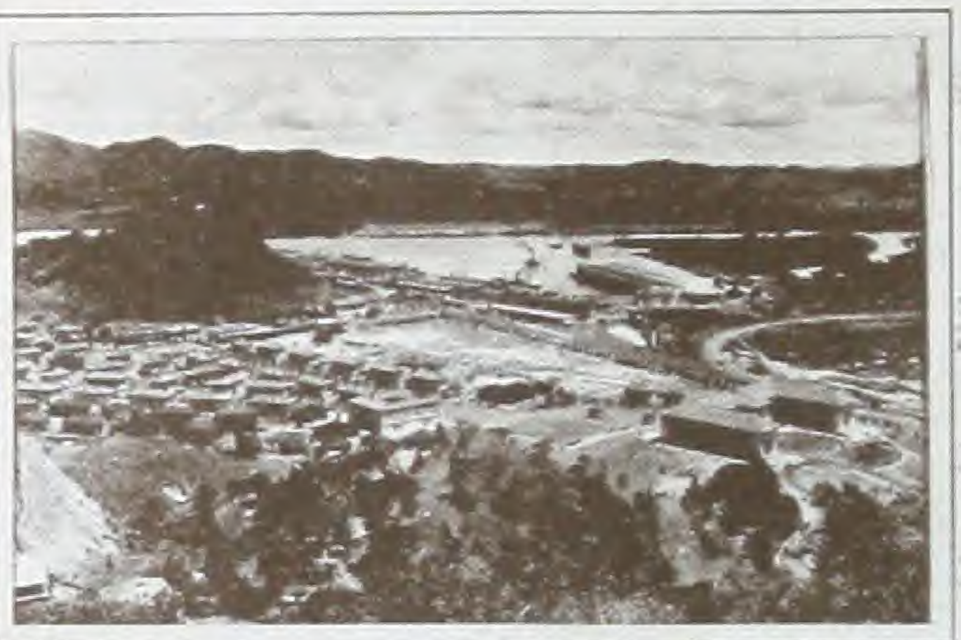
Page 11, second paragraph should read "On Chart III".

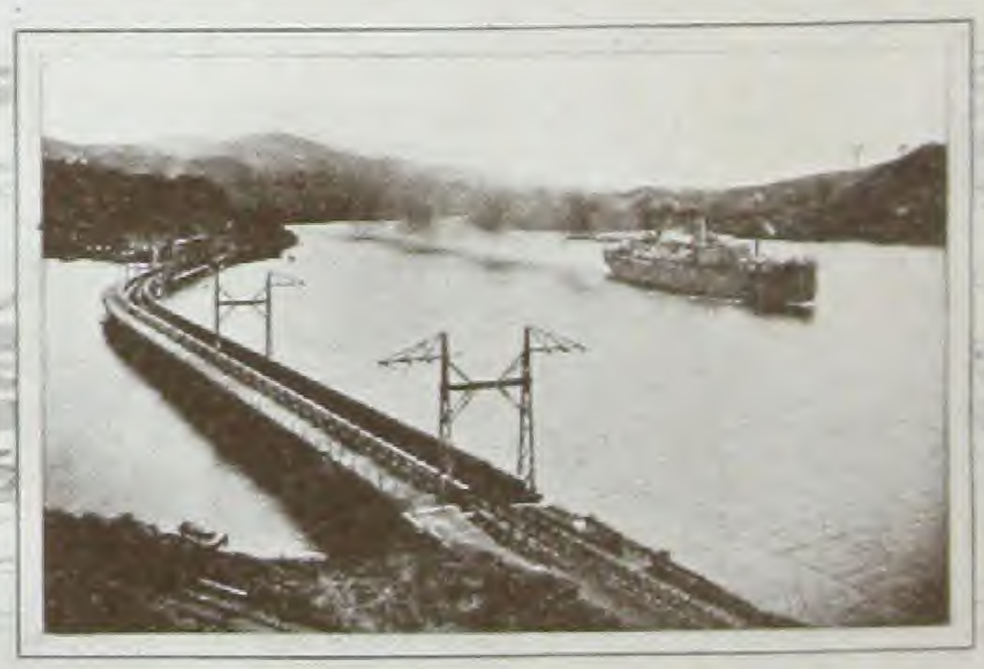
PROTEXOL CORPORATION
SUCCESSOR TO CARBOLINEUM WOOD PRESERVING CO.
34 BARCLAY ST. NEW YORK, U. S. A. WORKS: KENILWORTH, N. J.

Pennsylvania Hotel, New York. McKim, Mead and White, Architects, specified Protexol for the treatment of over 50 miles of screeds.

Panama Canal where U. S Engineers specified and used Protexol Wood Preservative for all lock fender timbers, trestles and other timber work

Hell Gate Bridge of the New York Connecting Railroad. Protexol used for the open tank treatment of 3,000,000 ft. B M. of ties and timber upon the specification of Mr. Gustav Lindenthal, Chief Engineer. Snare & Triest Co., New York, Contracting Engineers.





FOREWORD

TO all who contributed to this collection of specimens we extend our heartiest thanks. So far as is known this represents the largest collection of its kind.

Theory and practice frequently differ and hence it is considered advisable to draw conclusions only from known results. Opinions based on laboratory tests may be exceedingly valuable as indicating what may be expected, but they by no means furnish a positive proof one way or the other. Theoretical results are obtained by changing in tests one factor at a time. In wood preservation we are dealing with an organic material—with widely varying structural differences in the wood itself. In replying to a question concerning timber preservation asked by the Committee on Wood Preservation of the American Railway Engineering Association, W. F. Sherfesee, a former chief of the United States Forest Service, Wood Preserving Office, stated: "It is often necessary to find an explanation for known results than it is possible to predict such results with accuracy."

Only such specimens are listed in the index (pages 24 to 27) concerning which definite data could be obtained. Names and locations are given in each case to enable direct correspondence and investigation. All the specimens can be inspected at our offices. They offer mute yet convincing testimony to the forty-five-year-old quality of Pretreat Wood Preservative. Silently they attest that continuity or the maintenance of an unbroken antiseptic zone and not penetration or absorption of the preservative is the true measure of protection against decay.

The reader will observe from the tables on page 21 that the range of woods, conditions of exposure and climatic conditions is sufficiently wide to enable the drawing of definite conclusions on the value of surface treatments with Pretreat Wood Preservative. The table on page 23 will assist in verifying the correctness of such conclusions. This further indicates the necessity of giving a preservative treatment to timber placed in situations subject to rapid decay.

Pretreat is merely the new name for an old product.

The production of standardized wood preservatives constitutes the primary operations at our works at Kenilworth, N. J. Incidentally and to enable economic production a line of coal tar products is offered. Among these is commercial creosote, but there are only three grades of wood preserving oils that we are willing to recommend for surface treatments, i.e., brush, spray or open tank treatments.

The recognition accorded us in our field of endeavor is sufficient inspiration to cause a continuance of our studies and researches along the line of industrial progress in the preservation of wood—to initiate as well as to develop new and better ways of preventing the decay of structural timber.

ERNEST F. HARTMAN, Assoc. Am. Soc. C. E.
President

(102-103) Comparable yellow pine ties from Jamaica Bay Trestle of the Long Island Railroad Co. Placed green in January, 1907. No. 102 received two brush coats of heated Protexol. No. 103 was left untreated.

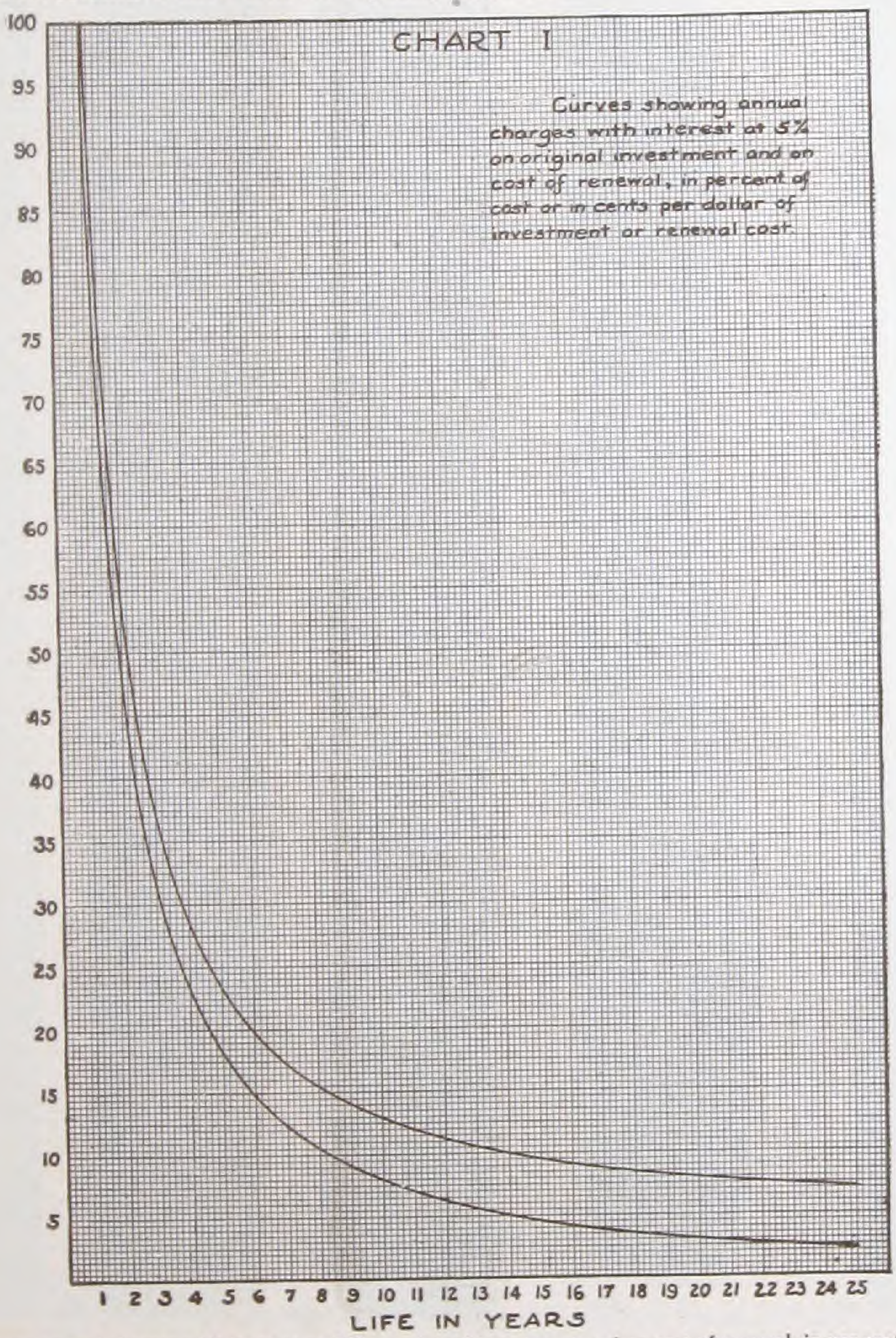
(106-107-108) Chestnut ties from Millville Traction Co., Millville, N. J. According to Mr. D. C. Lewis, General Manager, these ties were originally placed October 15, 1907. All were placed in the same kind of soil and under the same conditions in order to test the efficiency of wood preservatives. No. 108 was untreated, No. 107 was open tank treated with creosote and No. 106 received open tank treatment with our preservative. A colony of termites (white ants) was found in the tie treated with creosote. According to Mr. Lewis, "the ties treated with your preserver are doubtless good for another five years, while all the other ties are decayed."

THE ANNUAL CHARGE AGAINST TREATED TIMBER

By E. F. PADDOCK, *Chemical Engineer*

THE art of preserving wood has reached a point where it is admitted to be financially sound. Railroads spend thousands of dollars for plants to preserve their ties and thousands more for preservatives and find it a paying investment. The question arises in the mind of every one who uses timber, be it much or little, "How much can I afford to spend for preservative treatment?" "Will I gain or lose by it?" "Will it pay?"

The formulae and tables appearing in this discussion are of such a general nature that they are applicable to preservative treatments of any form, whether it be the painting of a house, the building of a garage to protect a car or the use of the fertilizer in a garden to preserve fertility of the soil. Since the title of the paper limits the subject to the preservation of timber, the examples and illustrations have been confined to the known results obtained through the use of Protexol Wood Preservative. The reader will doubtless find many problems other than those of wood preservation to which these charts and tables will be equally applicable.



Curves showing annual charges with interest at 5% on original investment and on cost of renewal, in per cent of cost or in cents per dollar of investment or renewal cost

23 24 26 27 28

Specimens 23-24.—Comparable Western yellow pine ties from Denver City Tramway Co. Courtesy of Mr. John Evans, Chief Engineer. "No decay or rail wear and spikes holding firm on the ties that received a fifteen-minute immersion in your preservative."

Nos. 26-27-28.—Contributed by Southern Pacific Co. Treated ties in service ten years, hard and well preserved. Railwear negligible under heavy power and traffic in main track. "They are superior to untreated fir, hold spikes in good shape and last longer by five years."

Attempts have been made to determine just how much wood preservative treatments are worth, but they have been confined largely to specific cases. It is the writer's object to present certain data based on sound financial rules whereby one may determine accurately and without complicated mathematical processes just how much he can afford to spend in order to extend the life of timber or how much can be saved by so doing.

In the first place it will be evident that the actual cost of the timber is not the initial cost, but rather the cost per year or annual charge and that this will depend upon the life of the timber. It is assumed that in order to purchase the timber capital must be borrowed at interest and paid back in equal amounts annually at a rate that will just wipe out the debt in the lifetime of the timber. The amount of these annual payments is the annual charge, it is what the timber is actually costing per year.

Suppose c= the borrowed capital= cost of timber in place
r= the rate of interest expressed as a decimal
n= life of the timber in years
a= annual charge

If the timber lasts but one year the annual charge $a = (1+r)\,c$ or the borrowed capital plus the interest for one year.

If the timber lasts two years the annual charge: $a = \frac{c\,(1+r)^2}{1+(1+r)}$

If the timber lasts three years the annual charge: $a = \frac{c\,(1+r)^3}{1+(1+r)+(1+r)^2}$

From this we determine the general formula for a term of n years as follows: $a = c\left[\frac{r}{(1+r)^{n}-1}+r\right]$

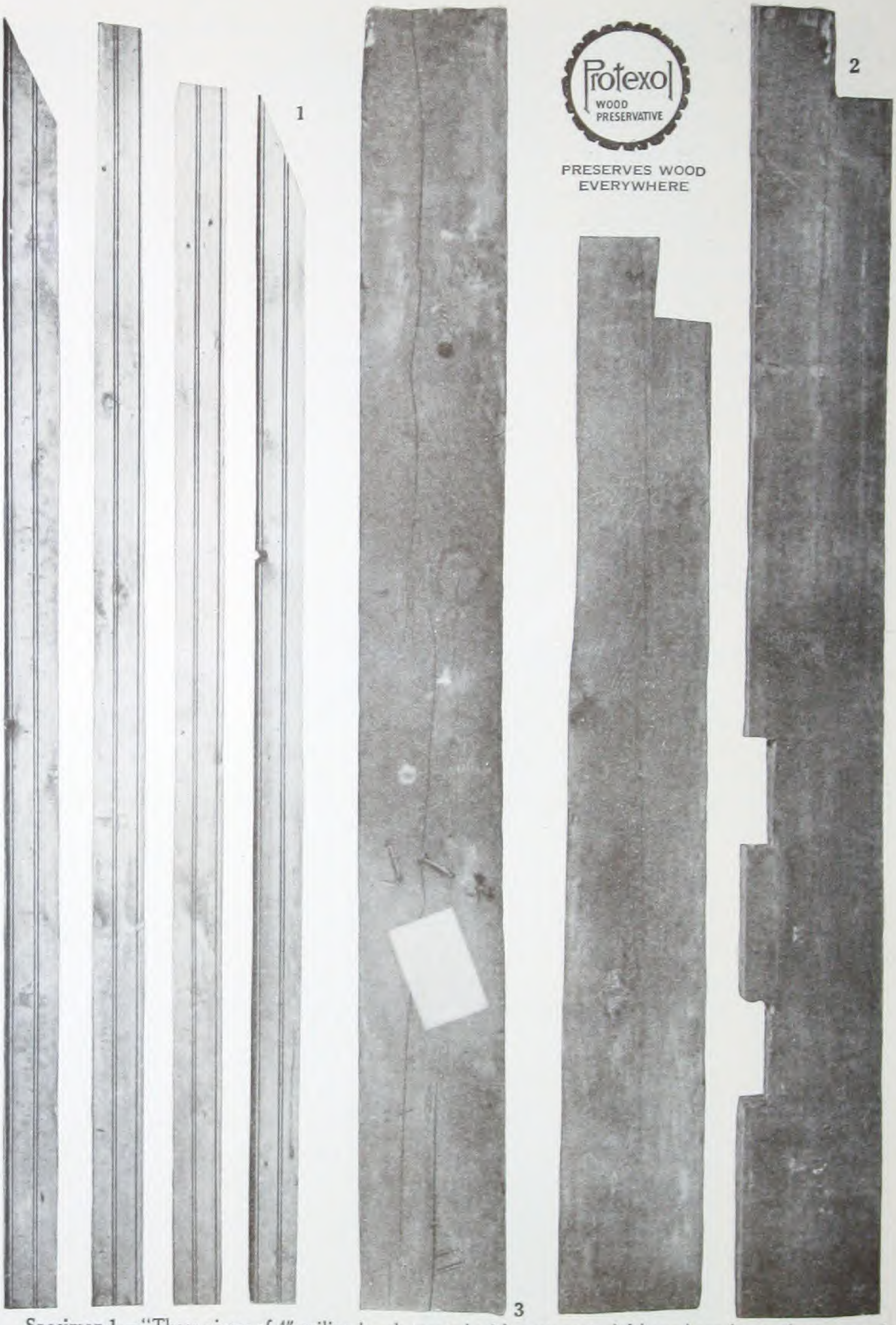
From this formula the values of "a" or the annual charge for terms of from one to twenty-five years with interest at five per cent per annum have been determined. These values in Table I are expressed in per cent of the initial cost of the timber in place, that is, including the labor charge for erection or in cents for each dollar invested. They have been calculated to the eighth decimal place and the table as here produced permits a possible error of less than one-half cent in the annual charge on $1,000.

TABLE 1

Annual Charge in Per Cent of Original Cost for Various Periods

Life in Years	Annual Charge in Per Cent of Original Cost	Life in Years	Annual Charge in Per Cent of Original Cost	Life in Years	Annual Charge in Per Cent of Original Cost
1	105.0000	10	12.9505	18	8.5546
2	53.7805	11	12.0390	19	8.2745
3	36.7209	12	11.2825	20	8.0243
4	28.2012	13	10.6456	21	7.7996
5	23.0975	14	10.1024	22	7.5970
6	19.7017	15	9.6342	23	7.4137
7	17.2820	16	9.2270	24	7.2479
8	15.4722	17	8.8699	25	7.0953
9	14.0690				

For example, suppose that timber costing $2,000 in place has an average life of five years. According to this table the annual charge at five per cent interest is 23.0975% of $2,000, or $461.95. Suppose then that $2,000 is borrowed at five per cent interest. At the end of the first year this amounts to $2,100 on which $461.95 is paid, leaving a residual debt of $1,638.05 at the beginning of the second year. At five per cent this amounts to 1.05 times 1638.05 or $1,719.95 at the end of the second year. On this $461.95 is again paid off leaving an indebtedness of



Specimen 1.—"These pieces of 4" ceiling brush treated with your material have been in continuous service in the hoods over our paper machine ten years, and this is the best recommendation we can give, as previously we built hoods of the same material, giving them three coats of white lead and renewing them at least within 18 months." Courtesy Northwest Paper Co., Cloquet, Minn.

Specimen 2.—Brush treated roof timber from dyehouse of Clinton (Mich.) Woolen Mfg. Co., sound after ten years of service under conditions under which previous roof rotted out in five years. Fully exposed to steam and fumes from dye vats and dripping with moisture from condensed steam most of the time. "We are glad to donate this timber and trust that it will be useful in inducing a wider use of your preservative."

$1,258 at the beginning of the third year. Proceeding in this way it will be evident that at the end of the fifth year the final annual payment of $461.95 will exactly wipe out the remaining indebtedness. The timber has been paid for in five years at an annual outlay of $461.95.

There are various ways of viewing this problem and of handling the financial end of the business of construction and maintenance, but this is probably the most rational as well as the simplest. Various authorities have derived formulae and tables for computing these annual charges. Dr. B. E. Fernow, at the time Chief of the Forestry Division of the U. S. Dept. of Agriculture, published in Bulletin No. 1 of that Division in 1887, two tables, based on this principle, one showing the annual charges against ties costing various amounts and lasting for various periods, and the other showing the annual charge against ties for renewal. The latter subject will be taken up in another part of the present paper.

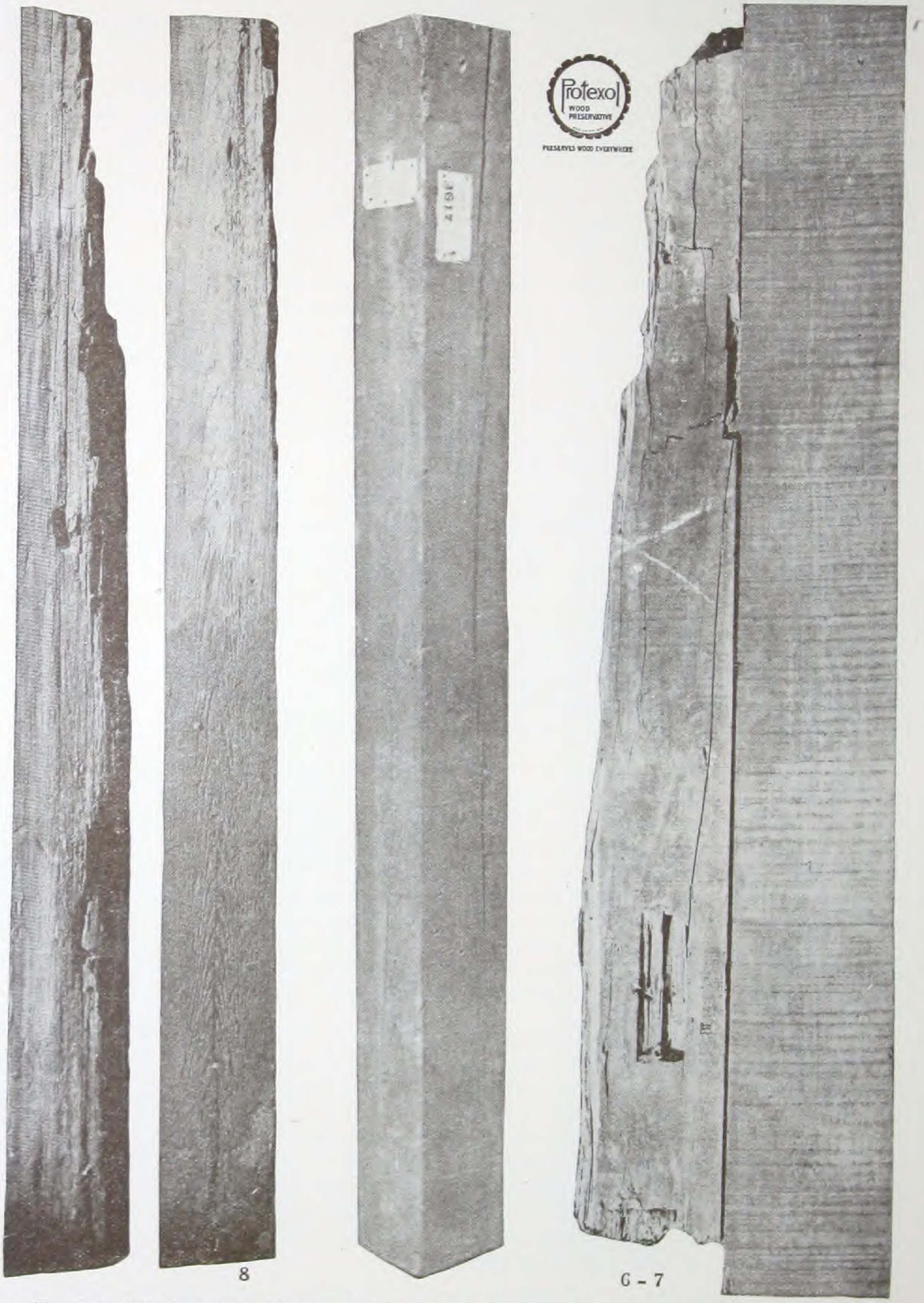
It was the writer's original intention to use Dr. Fernow's formula and table in the present discussion, but his formula, while correct, was so stated as to be somewhat obscure. Furthermore his table gives results correct only to the first decimal place, which means a possible error of five cents in the annual charge on an investment of $100, and a serious error occurs in the annual charge figure for a period of twelve years. In view of these facts it was thought best to restate the formula in a clearer and more understandable form, and to derive from the formula a corrected table which gives values that are much more accurate for precise calculation. The result you have before you, and in addition the table has been put in the form of a curve (Chart 1) from which approximate values may be obtained for rapid estimating and comparison.

The case of the Denver City Tramway Co., specimens of whose treated and untreated ties are in our collection (see page 6) may be taken as an example of the operation of Table 1. The untreated ties were completely decayed in five years. Assuming that they cost 65c. each and that the labor of putting them into the track amounted to 20c. each, the total cost in the track was 85c. The annual charge at five per cent on 85c. for five years is 23.0975% of 85c. or 19.6c. Mr. Evans states that treatment with Protexol Wood Preservative cost them 16 to 18c., say 17c., and that the life of the treated ties is 10 years. The treated tie then costs them 85c. plus 17c., or $1.02, and lasts 10 years. The annual charge, according to Table 1, will be 12.9505% of $1.02, or 13.2c. as compared with 19.6c. for the untreated tie, an actual saving of 6.4c. per tie per year. If the ties are laid 18 inches center to center this means 3,520 ties per mile, or a saving of $225.28 per mile per year. On the entire system of 31.874 miles of track this amounts to $7,180.57 per year, which is equivalent to a four per cent dividend on $179,514.

Suppose now that a certain structure lasts five years untreated. The annual charge against this timber is 23.0975% of the original cost. Now, if by some preservative process the life can be extended to seven years, the annual charge, according to Table 1, is only 17.2820% of the initial cost. Then if the annual charge is to remain unchanged the initial cost can be increased to 23.0975÷ 17.2820 or 1.336 times the cost of the untreated timber. In other words, one can afford to spend 33.6c. on every dollar's worth of such timber for a treatment that prolongs its life from five years to seven years, and not increase the annual charge. With lumber at $40 per thousand feet B.M. this means an allowable limit of $13.44 per thousand feet for treatment. If the life is extended to ten years, or double the life of untreated timber, the allowable limit is $.7835 on $1, or $31.34 per thousand feet. Treatment with Protexol Wood Preservative costing $10 per thousand feet B.M. or less, would in most cases accomplish the same result at a net saving in this case of $21.34 on every thousand feet B.M.

As a matter of actual experience, the Clinton Woolen Mfg. Co. of Clinton, Mich., actually increased the life of the timbers on their dye house roof from five years untreated to ten years with a brush treatment (Page 8). These timbers were 4" x 8" white pine which would require for one brush coat approximately four gallons of Protexol Wood Preservative per 1000 ft. B.M. Probably $5 per 1000 ft. B.M. would amply cover the cost of treatment. Putting the price of white pine at $100 per 1000 ft. they could afford to spend $78.35 per 1000 ft. B.M. to obtain a result which actually cost only $5.00, a net saving of $73.34 per 1000 ft. B.M. A similar case is that of the Hutchinson (Kans.) Inter-Urban Ry. Co. whose untreated ties lasted only five years. These ties, according to the statement of Mr. W. A. Scothorn, the General Manager, cost 70c. each. Treatment costing 15c. increased the life to ten years. According to the tables they could afford to spend 78.35% of 70c. or $.548 per tie to obtain the result that cost them but 15c., the actual saving being 39.8c. per tie.

From the same data Table 2 and a second curve (Chart II) has been plotted which shows the investment which will give an annual charge of $1 for any given term of years from 2 to 25 years.



Nos. 6-7.—"These representative samples of treated and untreated mine planks are from the same location in the mine. Timbers treated with your material have never shown any signs of rot, while untreated timber has to be replaced in from one to two years." Kindness of Mr. Robert M. Randall, Gen. Mgr., Consolidated Coal Co., Saginaw, Mich.

No. 8.—Messrs. C. Deutermann & Son, of White Plains, N. Y. contributed this sill from their ice house erected in 1893. One end of the sill was brush treated as may be noticed. "Ordinarily these sills would have rotted out in five years, and it would cost $600 to $700 to replace them. It makes the wood last four times as long."

TABLE 2

Investment Which at Five Per Cent Interest Will Require an Annual Charge of One Dollar

Life in Years	Investment in Dollars	Life in Years	Investment in Dollars	Life in Years	Investment in Dollars
1	.952	10	7.723	18	11.689
2	1.859	11	8.306	19	12.085
3	2.723	12	8.863	20	12.462
4	3.546	13	9.394	21	12.821
5	4.329	14	9.899	22	13.163
6	5.076	15	10.380	23	13.489
7	5.786	16	10.838	24	13.797
8	6.460	17	11.274	25	14.094
9	7.108				

From this we find that an investment of $4.329 will require an annual payment or charge of $1 if the life of the timber is five years, while if the life is increased to seven years we can invest $5.786, and the annual charge remains $1 per year. In other words, we can spend the difference between $4.329 and $5.786 or $1.459 equivalent to 25.2 per cent for a preservative treatment that will add two years to the life of a five-year timber costing $4.329 untreated, without increasing the cost per year. Any investment for treatment less than this difference means a corresponding cash saving.

On Chart II the horizontal scale represents the number of years added to the life of untreated timber as a result of preservative treatment. The vertical scale represents the amount that can be spent to obtain such extended life without increasing the annual charge, expressed in per cent of the cost of untreated timber, or in cents for every dollar invested in untreated lumber.

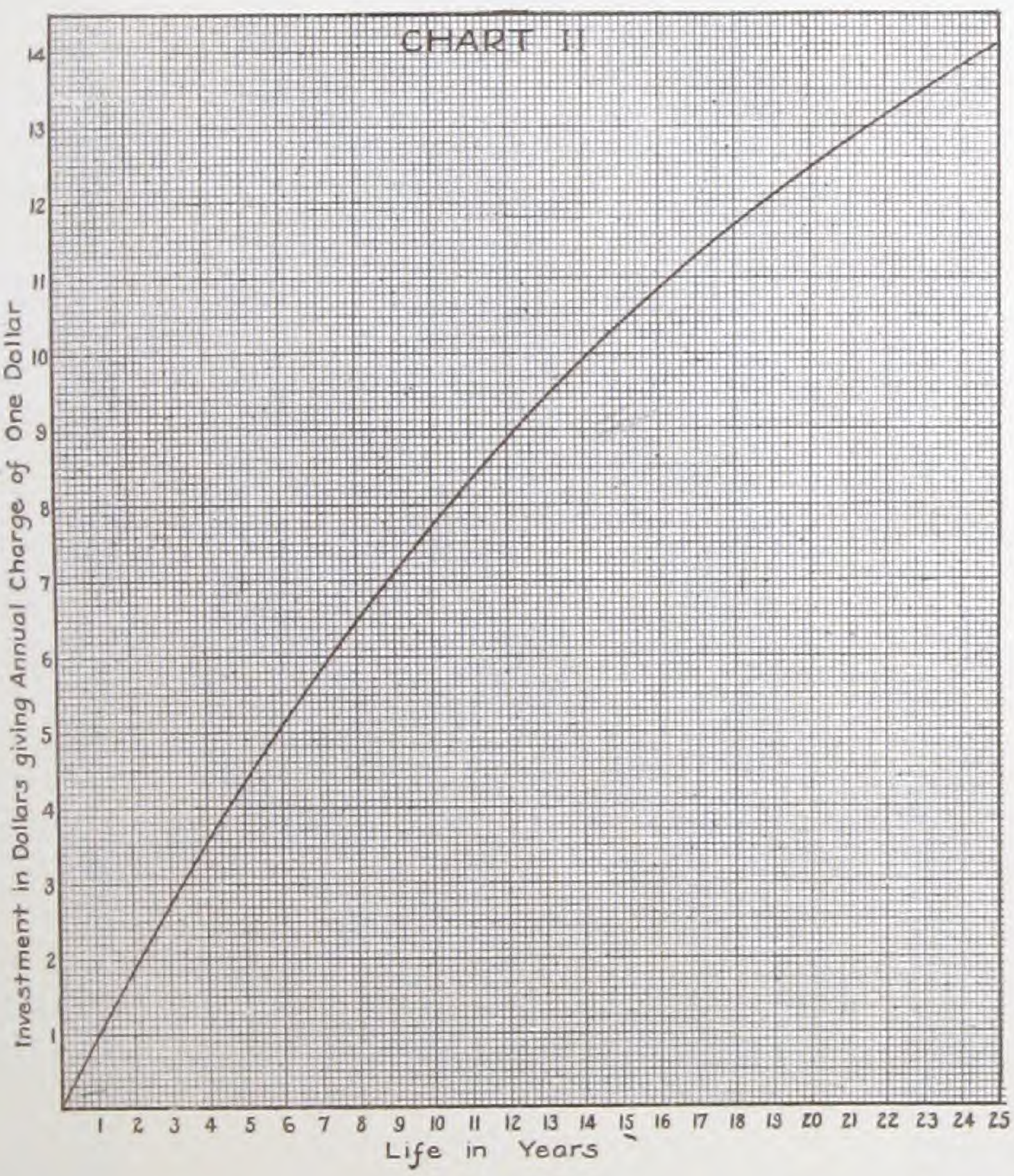


Table 3 and Chart III combine the former tables and charts by showing how much is available, or what can be spent for preservative treatment to obtain longer life for timber.

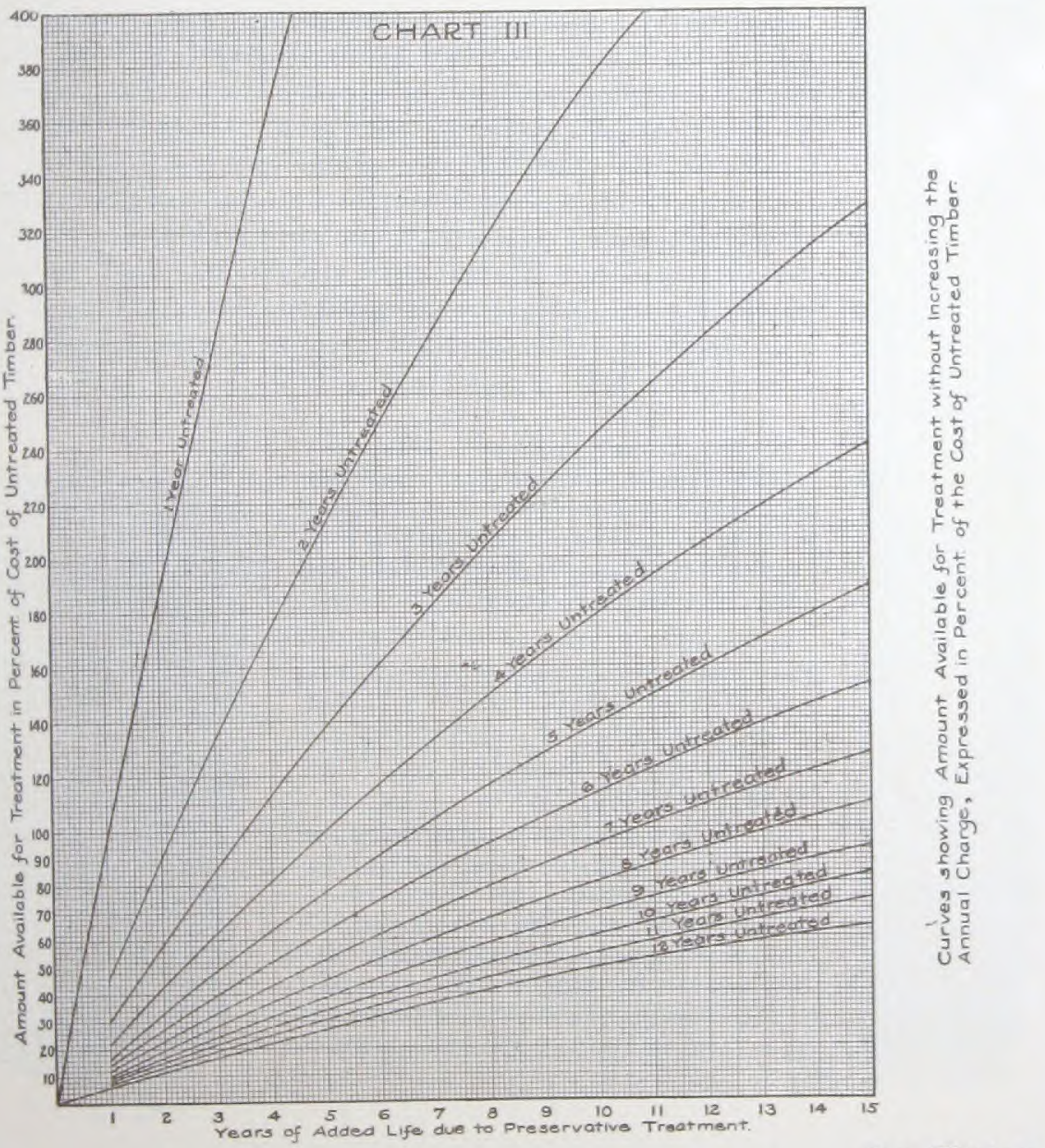
29 - 30

No. 20

Open tank (Protexol Quality) treated timber (No. 111) from set of gangway timbers in the Bellevue Mines of the D. L. & W. R. R. at Scranton, Pa., in perfectly sound condition after 6½ years' service. Compare with untreated member (No. 112) after 2 years' service. Average life of untreated timber, 2 years. Comparative tests made in co-operation with the U. S. Forest Service, who had charge of treatment and placement. Forest Products Project No. 102.

TABLE 3—Table of Amount Available for Treatment Without Increasing Annual Charge Expressed in Per Cent of Cost of Untreated Timber

Life, Untreated, Years	Years of Added Life Due to Treatment														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	95	186	272	355	433	508	579	646	711	772	831	886	939	989	1038
2	46	91	134	173	211	248	282	315	347	377	405	432	458	483	506
3	30	58	86	113	138	161	182	205	225	245	263	281	298	314	329
4	22	43	63	82	100	118	134	150	164	179	193	206	218	230	241
5	17	34	49	64	78	92	105	117	128	140	150	160	170	179	189
6	14	27	40	52	63	75	85	95	105	113	122	130	138	146	153
7	12	23	33	43	53	62	71	79	87	95	102	109	115	121	127
8	10	19	28	37	45	53	60	68	74	81	87	93	98	104	109
9	9	17	25	32	39	46	52	59	64	70	75	79	83	88	94
10	8	15	21	28	34	40	46	51	56	61	66	70	74	79	83
11	7	13	19	25	30	36	41	46	50	54	58	62	66	70	74
12	6	11	17	22	27	32	37	41	46	49	52	56	58	61	64



Curves showing Amount Available for Treatment without Increasing the Annual Charge, Expressed in Percent. of the Cost of Untreated Timber.

No. 25

It will be seen that there are many cases in which one can afford to spend more for treatment than the timber cost originally. An example of this kind is found in the Bellevue Mine specimens (Page 12). Here the average life of the untreated timber is only two years. These specimens of sound treated timber were in place six and one-half years and were in perfect condition. Suppose that in only six years the treated timber was so badly decayed as to necessitate renewal. They would have added four years to its life and one could afford to spend $1.73 for treating every dollar's worth of timber to obtain this result. As a matter of fact the treatment will probably add at least eight years to the life of the timber and the company would have been justified in spending $3.153 on every dollar's worth of timber to obtain this result.

Similar extreme cases are not hard to find. Only a very few examples are mentioned, specimens of which are to be found in our collection.

The Northwest Paper Co. of Cloquet, Minn. (Page 8), increased the life of ceiling boards in their hoods from one and one-half years to ten years for which they could afford to spend six times the cost of the timber. C. Deutermann & Son of White Plains, N. Y. (Page 10) made ice house sills last twenty years that untreated lasted only five years. They could have spent 1.89 times the cost of the lumber to do this. Robt. Hartwig (Page 16) increased the life of his oak fence posts from five years to eighteen years. Any cost of treatment amounting to less than 1.7 of the cost of the posts would have meant a net saving to him. Samuel Gray at Providence, R. I., increased the life of his spruce wharf planking (Specimen 80) from one year to ten years at a cost considerably less than 7.11 times the cost of the untreated timber, although he would have been justified in spending that amount. The Cleveland Marine Railway made barge sheathing (Specimens 83 and 84), whose life was two years, last seventeen years. For this they could have spent 5.06 times the cost of the sheathing without increasing the annual charge against the timber.

The above examples are of course extreme cases, but they are by no means exceptional, rather they are what may be expected under similar conditions at all times, and the cost of applying Protexol Wood Preservative is but a fraction of what might be spent without increasing the annual charge.

On Chart III there are twelve curves, each representing timber with a certain life untreated. The only precaution to be observed in using the chart is to bear in mind that the scale at the bottom represents the years of life added as a result of treatment and not the total life of the treated timber.

Up to this point the annual charge necessary to pay for the cost and installation of the timber only has been dealt with. There is, however, another expense connected with timber in structures that is sometimes overlooked. This is the renewal charge or as it might better be called, the removal charge. It consists of the cost of removing old timbers before replacements can be made, together with any additional cost of

No. 74

installation above that of the installation of the original timber. It is customary to set aside a certain sum each year, so that at the time when the timber must normally be renewed a fund will have accumulated which, with the interest will be sufficient to cover this renewal charge. Here a different condition is to be met, for instead of borrowing money on which interest must be paid, a sinking fund is set aside which earns interest. Naturally the cost of renewing a treated timber is the same as that for untreated timber. The only element which affects this annual renewal charge is the frequency with which renewals must be made, the longer the life of the timber the more time is available in which to accumulate the necessary money, and consequently the smaller is the amount that must be set aside annually.

In Table 4 have been placed the annual charges for renewals occurring with frequencies of from two to twenty-five years at five per cent compound interest. The annual charges are expressed in percentage of the renewal cost, or in cents per dollar of renewal cost. These charges have further been put in the form of a curve which appears at the bottom of Chart I.

TABLE 4

Annual Charge in Cents for Renewals Costing $1 and Recurring at Intervals of Two to Twenty-five Years

Years	Annual Charge	Years	Annual Charge	Years	Annual Charge	Years	Annual Charge
2	48.780	8	10.472	14	5.102	20	3.024
3	31.721	9	9.069	15	4.634	21	2.800
4	23.201	10	7.950	16	4.227	22	2.599
5	18.098	11	7.039	17	3.870	23	2.414
6	14.702	12	6.283	18	3.554	24	2.247
7	12.282	13	5.645	19	3.275	25	2.096

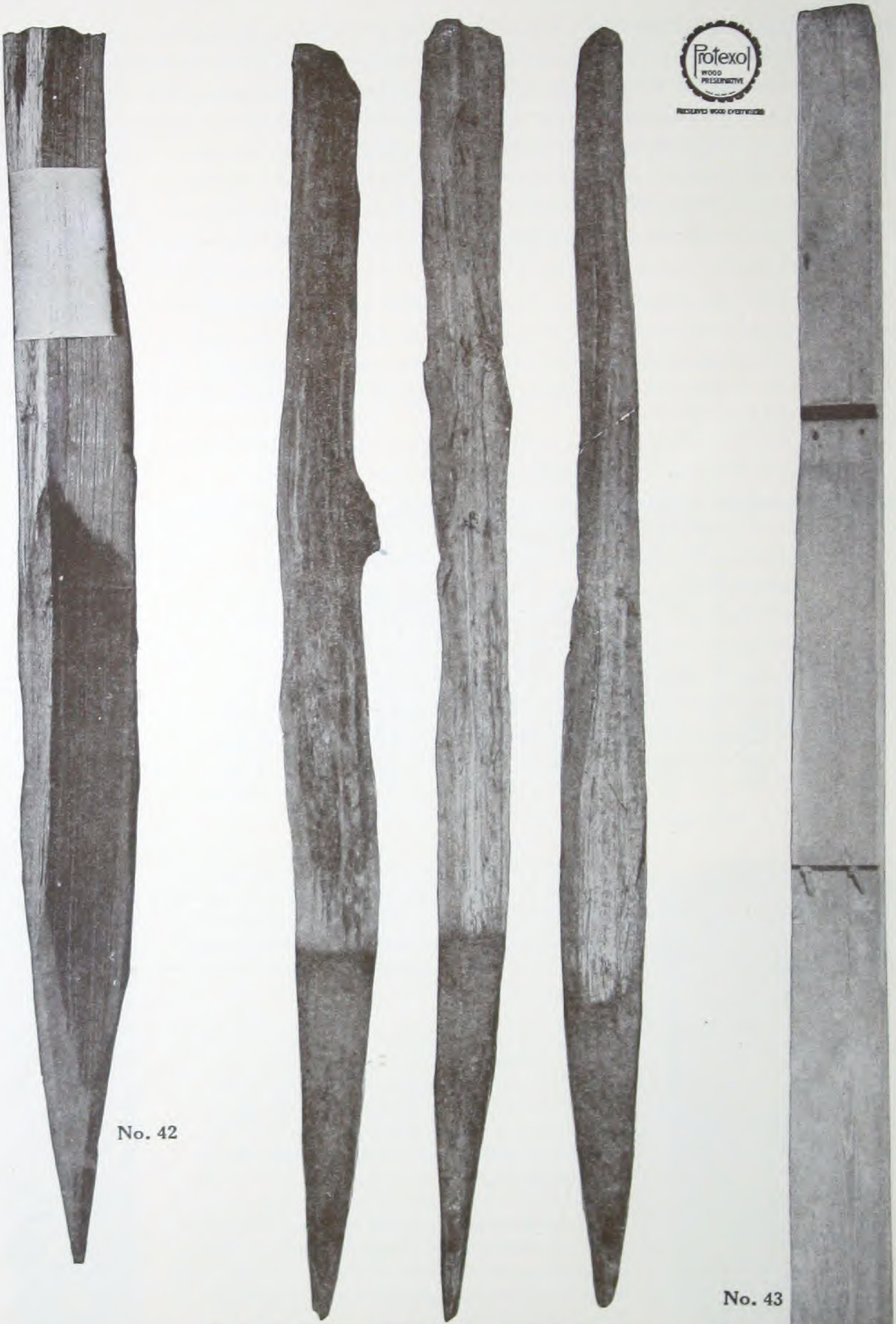
No. 75

From this table it appears that renewals costing $1 and recurring every five years, cost 18.098c. per year while if the life is extended to seven years the renewal cost is reduced to 12.282c., a net cash saving of 5.816c. on every dollar. This saving is in addition to any saving on the cost of the timber.

The charge for renewals is usually neglected in preliminary estimates, since it is as a rule only a small fraction of the total annual charge against the timber. It is, however, an item that should not be lost sight of, as there are many cases in structures where from inaccessibility or peculiarities of construction the cost of removing old timbers becomes formidable.

In most ordinary cases Table 3 or Chart III will be all that is necessary, since from these is determined how much one can afford to spend for a preservative treatment. This factor alone frequently determines the kind of treatment best suited.

No. 31



No. 42

No. 43

(48-49-50) Good after 18 years. Specimens from farm of Mr. Robert Hartwig, Willard, Mo. Butt ends painted with two coats of Protexol Wood Preservative. These white oak posts are good after 18 years. Similar posts set untreated lasted only 5 to 6 years in same soil.

SURFACE TREATMENTS

BEARING in mind that nearly half the consumption of wood is in rural districts it will be evident at once that brush, spray and open tank treatments are desirable for a very large proportion of our total wood consumption. Add to this the requirements of many and varied industries for construction timber, and it will become evident that surface treatments are designed to best serve most economically the requirements of a very large and important proportion of wood users, whose aggregate consumption is probably close to two-thirds of the total volume of wood used. Construction timber, flooring, poles, posts, cross-arms or lumber can be very effectively protected against decay by surface treatments. The desire to secure effective treatment for structural timber after framing at the point of construction also frequently determines the advantages of the open tank method. By a proper regulation of the time and temperature of the preservative bath or baths this method is equally effective for green or seasoned timber. The determination of these factors requires a proper understanding of the kind and quality of timber to be treated and the condition of its subsequent exposure. The knowledge and experience gained in our many years of research work are available to all users of Protexol Products. Surface treatments because of their flexibility make available to anyone the benefits and economies to be secured from the preservative treatment of timber.

GENERAL DIRECTIONS FOR USE

For selecting the best method applicable to any conditions and to prompt when in doubt, Circular 89 will serve as a guide

BRUSH TREATMENTS.—Thoroughly mix by rolling or stirring the preservative in the original container before drawing off a supply. Use a wide, flat brush (not set in glue), with long handle. Roofing brushes are good for large surfaces. Heat the Protexol to 150–200° F. according to the weather and the dryness of the wood, always above 212° F. (boiling point of water), if the wood is damp from rains or snow, green or watersoaked. If the wood is dry and the air temperature above 70° F. good results will be obtained without heating the Protexol. Use an iron pot or our special steel tank for heating Protexol over an open fire. A plumber's torch, gasolene or kerosene burner may be used to heat the preservative. To keep out rain, snow or dirt, containers should be kept covered when not in use. A thermometer should be used to check the temperature of the preservative. (For accessories, see Leaflet 8).

Protexol is not an oil paint. It does not form a skin or coating that seals up the wood pores. It should be heavily applied to give sufficient oil for penetration; do not brush out thin. Brushes soaked in Protexol will not harden

Allow one coat to penetrate thoroughly before applying the next. Two coats should always be applied. When treating unseasoned wood, give one coat and wait, if possible, until the surface has dried before applying the second.

Run all cracks full of oil and give extra heavy treatments to knotty spots, mortises, tenons, cut ends and points of contact or bearing surfaces. An additional coat is advisable for such surfaces. The capillary attraction of the wood will facilitate the impregnation where the grain is exposed.

A wet appearance of the surface after the treatment is finished is a good indication of a thorough brush or spray treatment.

SPRAYING.—When large surfaces are to be treated, a spraying machine is useful. It is the best method for getting the preservative into joints on timber already erected. Apply with good pressure in a fine spray until the Protexol begins to run, seeing to it that all cracks, checks and joints are filled.

As the spraying tends to cool the oil, it should be hot (200 to 220° F.) to start with; spray applications are not recommended for cold weather. Use special oil hose.

It is inadvisable to brush treat or spray timber wet by heavy rains or snow

OPEN TANK TREATMENTS.—For the best results an immersion of the wood in Protexol is recommended. Cut and frame timber before treatment. With seasoned wood, especially those sorts which readily take up Protexol, a ten to fifteen-minute immersion in Protexol at 180–200° F. is recommended when the air temperature is at 60 to 70° F. When the air temperature is lower, that is, during colder weather, or for timber wet by rain or snow, a longer immersion should be given to compensate for the weather and insure the wood being as well treated as it would be under favorable conditions. With green wood, a longer immersion, up to one hour with the temperature of the bath above the boiling point of water, or a double tank treatment (hot and cold) may be required.

Rig up a tank suitable for the sized timbers to be treated. A wooden tank lined with sheet iron or tin and fitted with a steam coil is good. Steel tanks may be heated by direct fire. If a steel tank is to be built, order it to be oil tight, and where steam coils are to be used for heating Protexol, order all connections to be oil tight, and all threads to be freshly cut. Provide a device for keeping timber submerged during treatment.

If deeper penetration is desired or green wood is to be treated, we recommend two baths—a hot bath in Protexol at 220–240° F. followed by a bath in cold oil. If you contemplate such treatment, write to us for special directions, giving information asked for on our Consulting Blank (Circular 51).

The effectiveness of surface treatments depends upon maintaining a continuous unbroken antiseptic zone. Care should be taken that the comparatively thin layer of treated wood is not broken in subsequent handling.

Remember that the more Protexol is gotten into the wood and the deeper it penetrates, the better the protection from decay. Protexol should be applied hot; the damper the wood and the colder the weather, the hotter the oil should be Heating the Protexol insures a more rapid absorption by the wood, and a consequently deeper penetration. The antiseptic qualities also become more energetic, and as every crack or opening into the wood must be filled with Protexol, it will be apparent that the heated preservative more readily enters such seasoning checks or other defects.

Remember that when applying to old timber, all decayed or decaying parts must be removed, and the sound timber scraped clean. Rotten knots must be cut out regardless of their penetration into the stick. In applying to round timbers or timbers with wane remove carefully all fine inner bark.

Remember that the rich nut-brown color of Protexol will develop through oxidation in the air. Oil paint of dark shade may be applied over treated surfaces, but ample time should be allowed until the Protexol has thoroughly penetrated.

The success in adding to the life of timber is proportionate to the care exercised in carrying out these instructions.

TECHNICAL DESCRIPTIONS

PROTEXOL WOOD PRESERVATIVE NO. 1.—A non-volatile, heavy oil derived from the highest boiling distillate of coal tar. Its constituents belong to the anthracene group, the permanent antiseptic properties of which are generally acknowledged. After filtration and refining the oil is chemically treated to improve its character and to increase its efficiency. Made to the 45-year-old standard of quality for all general surface treatments. For protecting timber against premature decay this grade is recommended as the very best preservative—specifically where only brush or spray treatments are to be given. Where inflammability of the treated timber is the important factor, we unreservedly recommend the use of Protexol Wood Preservative No. 1.

PROTEXOL WOOD PRESERVATIVE NO. 2.—A straight run anthracene oil to meet the chemical standard for what is known as the carbolineum type of oil. Whenever the higher cost of Protexol No. 1 does not appear justifiable either owing to construction requiring a heavier open tank treatment; because the construction is not of a permanent character or for other sound reasons Protexol No. 2 is recommended. Where waterproofing is the prime object sought to be attained Protexol Wood Preservative No. 2 is suggested.

NEOSOTE WOOD PRESERVATIVE.—A mixture of the lighter anthracene oils obtained in redistilling to produce Protexol Wood Preservatives and heavy creosote oils. Liquid at all temperatures. Neosote is recommended for heavy open tank treatments where depth of penetration only is considered the measure of preservation or as a temporary preservative agent, or where the only object in using any preservative is high initial toxicity to destroy organisms on timber placed under conditions where decay is not likely if sound timber is used. Where the lowest cost compatible with a satisfactory return on the investment is sought, we advise Neosote.

NOTES.—It is worth bearing in mind that the item of labor cost will be substantially the same in the application of any one of the three grades. Equipment cost will likewise be substantially the same except where heavy open tank treatments are desired.

Protexol No. 2 and Neosote are more volatile, and their use is not expected to insure the factor of safety to be had from the use of Protexol No. 1, except that a larger quantity of Protexol No. 2 and Neosote will probably give the same results as a smaller quantity of Protexol No. 1.

SIMPLE—ISN'T IT?

70

32 33 34

78

71

Nos. 32-33-34.—Co-operation of C. E. Smith, Bridge Engineer, Mo. Pac. Ry. Co. "No. 32 butt of post immersed for ten minutes in a tank of boiling preservative. No. 33 painted instead of dipped with one coat of your preservative one foot below and one foot above ground. No. 34, no treatment. All three of long leaf yellow pine installed in stock pens at Pueblo, Colo., in the same location under identical conditions in 1902. All cut off one foot above ground line."

79

Nos. 70-71.—Kindness of Mr. W. S. Fitzsimmons, Asst. U. S. Engr., Georgetown, S. C. Specimens from a freight car built by U. S. Engineers in 1908. The sound timber received one brush coat treatment with Protexol.

Two specimens of yellow pine bulkhead timber from breakwater of the Metropolitan Coal Co., South Boston, Mass. When removed treated timber (No. 78) was perfectly sound, while No. 79, untreated, was completely worm eaten. Courtesy of Mr. Fred Hodgson, Chief Engineer, Massachusetts Board of Harbor and Land Commission.

No. 92

From Lyons Lines of Empire United Railways, constructed by J. G. White & Co. Untreated arms removed in five years. Treated arm after 10 years service. Courtesy of Mr. H. C. Prather, Asst. Gen. Mgr., Syracuse, N. Y.

Eleven years in red clay soil is certainly sufficient of a test. Only one hot brush coat was applied to the treated pole. They speak for themselves, and demonstrate the value of the treatment. Thos. A. H. Daniels, Engr., Birmingham (Ala.) Ry., Lt. & Pwr. Co.

No. 93

EVERYWHERE AND ANYWHERE

The specimens serving as the basis for this bulletin (pages 24 to 27) represent thirty states and territories, twenty-four industries; twenty-three different species of wood and forty-four uses of timber. They therefore truly represent a wide and varied experience and not merely success in isolated cases. Uniform rather than exceptional are the results of actual experience with the forty-five-year-old quality to which Protexol Wood Preservative conforms.

TERRITORIAL DISTRIBUTION

Alabama
Colorado
Connecticut
Florida
Georgia
Illinois
Iowa
Kansas
Maryland
Massachusetts
Michigan
Minnesota
Missouri
Nebraska
New Hampshire
New Jersey
New York
North Dakota
Ohio
Oregon
Pennsylvania
Rhose Island
South Carolina
Utah
Vermont
Virginia
Wisconsin
Canada
Cuba
Porto Rico

INDUSTRIAL DISTRIBUTION

Agriculture
Artificial Ice
Brewing
Building Construction
Coal Mine
Electric Lt. and Pwr.
Electric Railway
Fencing
Fishing
Greenhouse
House Building
Laundry
Lumber Mill
Marine
Natural Ice
Nursery
Paper Mill
Paving
Railroad
Stockyards
Sugar Refinery
Telephone
Textile
Water Works

WOOD DISTRIBUTION

Basswood
Black cypress
Cedar
Chestnut
Cypress
Eastern pine
Hemlock
Loblolly pine
Long leaf yellow pine
Oak
Oregon fir
Pitch pine
Red cedar
Short leaf pine
Spruce
Sweet gum
Tamarack
Washington fir
Western pine
Western yellow pine
White cedar
White oak
White pine

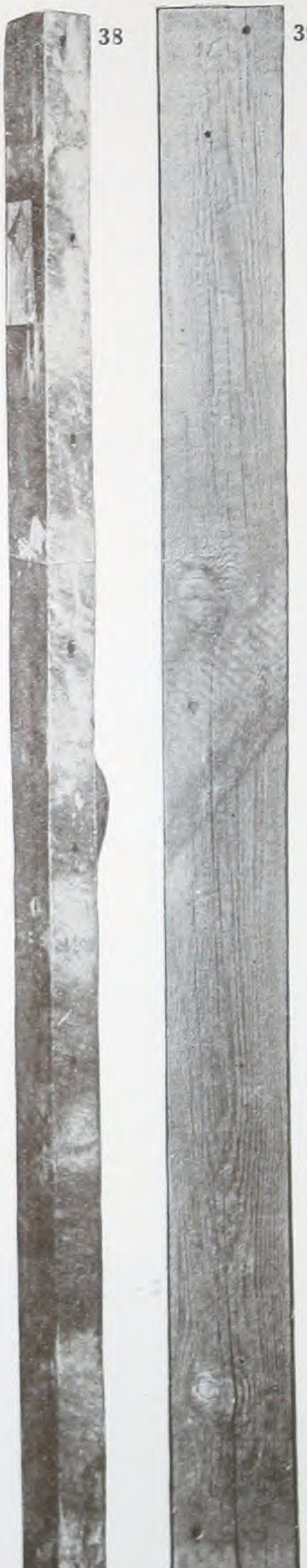
WOOD USES

Barge
Benches
Berry stakes
Bridge ties
Bulkhead
Clothes post
Coal dock roof
Conveyor
Cooling tower
Cross arms
Dye house roof
Fence posts
Flooring
Flume rack
Freezing room partition
Freight cars
Gate bar
Ice house sill
Idlers
Joists
Lighthouse
Lobster pots
Mine props
Paper machine hood
Partition
Paving blocks
Piling cap
Plant labels
Platform
Poles
Porch steps
Reservoir roof
Runway
Shaft timbers
Shed
Shed door
Shingles
Silo
Stock pen posts
Ties
Trestle
Walk stringers
Water tank
Wharf

Protexol WOOD PRESERVATIVE
PRESERVES WOOD EVERYWHERE

15-16.—Two sections of 4 x 12 inch joists, No. 1 brush treated with Protexol, No. 2 not treated. Placed in a floor at the plant of the Empire State Sugar Co., Lyons, N. Y., in 1900. These timbers were subjected to very severe conditions, alternate wet and dry, also extreme heat. The treated piece is as sound as when first placed. Assistance of Anaheim Construction Co.

No. 17



38

39

40

No. 18

Sound Means Serviceable

Decayed Means Renewals

LIFE OF UNTREATED WOOD PLACED SUBJECT TO DECAY

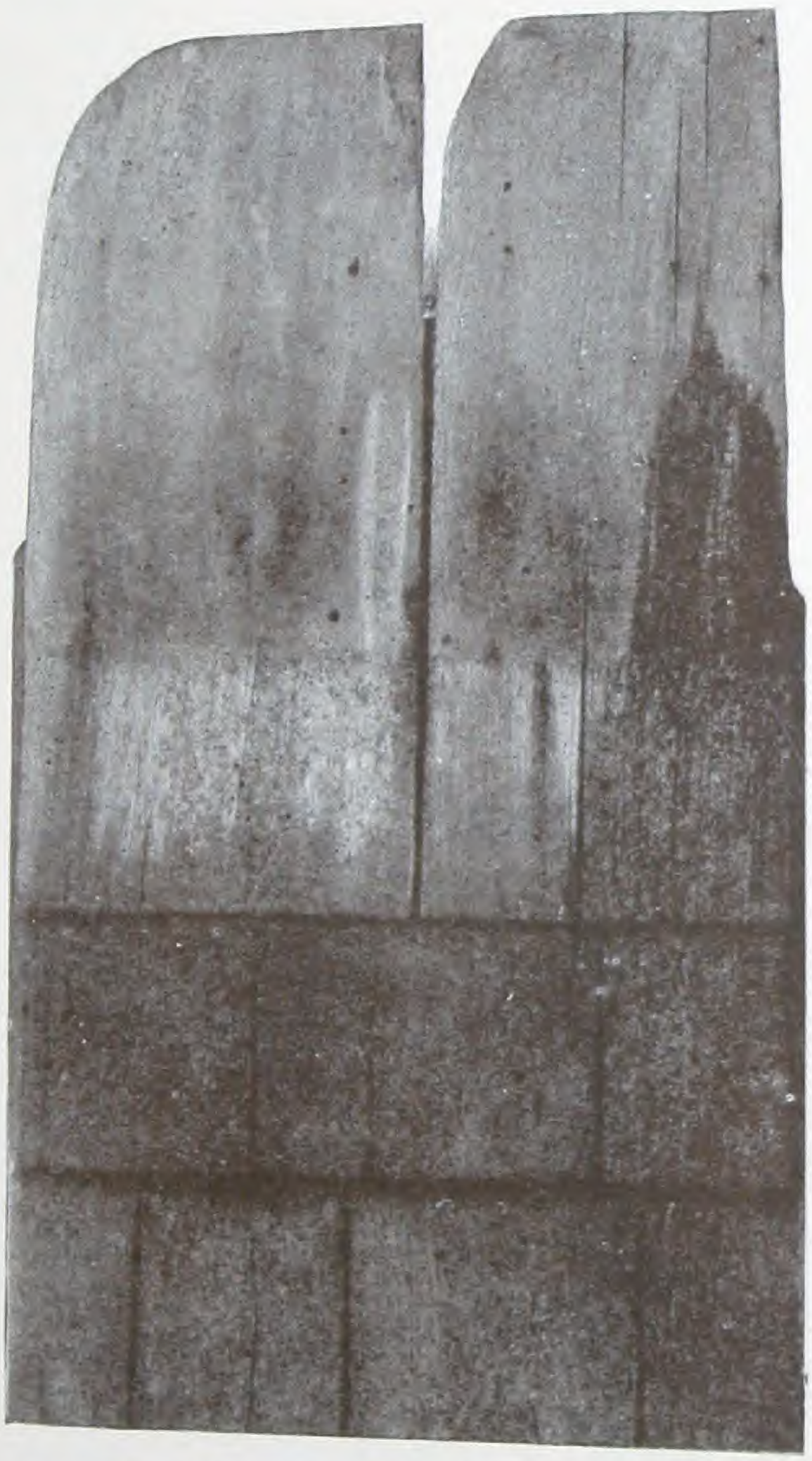
The following recent estimates are based on experience and actual inspection by the Forest Products Laboratory.

Untreated Material	Years
LUMBER:	
Chestnut	12
White oak	8
Elm	7
Ash	5
Maple	4
Birch	4
Poplar	4
Cottonwood	4
Tupelo	4
Basswood	4
White-heart beech	4
Red gum	4
Sycamore	3

Untreated Material	Years
POSTS:	
Locust	25
Osage orange	40
Mulberry	20
Catalpa	14
Chestnut	10
White oak	8
Red oak	5
Ash	5
Aspen	5
Gum	3

Untreated Material	Years
TIES:	
Black locust	20
White oak	8
Chestnut	7
White-heart beech	4
Birch	4
Maple	4
Red oak	4
Gum	3

No. 53.—Mr. Wm. P. Jessup, Building Contractor, 55 Adams St., Bridgeport, Conn., reshingled roof on his residence twenty-four (24) years ago using red cedar. Roof was painted with one coat of our preservative and is in excellent condition now.



No. 56—"The cedar shingles I am sending you today have been on the roof of one of my ranch buildings for twenty-four years. The carpenter whom I sent down to the ranch to get these stated that the roof was good for twenty-five years more. I have learned to know that yours is really a wood preserver." Henry Schulz, Cleveland Grove Stock Farm, Brainard, Neb.

No. 54.—Cypress shingles laid and brush-treated with one coat in 1892. No rot or decay found in specimens, and all shingles on roof are to-day in excellent condition. Specimens from Christ Weinlaeder, Drayton, N. D.

Specimen No.	Company	Location	Individual and Title	Industry	Subject	Mean Temp. Deg. F.
1	Northwest Paper Co.	Cloquet, Minn.		Paper mill.	Machine hood.	....
2	Clinton Woolen Mfg. Co.	Clinton, Mich.		Textile.	Dye house roof.	....
3	Ruemmeli Dawley Mfg. Co.	St. Louis, Mo.	J. J. Wurtenbacher, Secy.	Brewery.	Cooling tower.	56
4	Ruemmeli Dawley Mfg. Co.	St. Louis, Mo.	J. J. Wurtenbacher, Secy.	Brewery.	Cooling tower.	56
5		Drayton, N. D.	Christian Weinlaeder.	Agriculture.	Water tank.	36
6	Consolidated Coal Co.	Saginaw, Mich.	Robt. M. Randall, G.M.	Coal mining.	Mine plank.	40
7	Consolidated Coal Co.	Saginaw, Mich.	Robt. M. Randall, G.M.	Coal mining.	Mine plank.	....
8	C. Deutermann & Son.	White Plains, N. Y.	L. D. Raeder, Mgr.	Natural ice.	Ice house sill.	48
9	Florenceville Hotel.	Florenceville, Fla.		Laundry.	Flooring.	....
10	Florenceville Hotel.	Florenceville, Fla.		Laundry.	Flooring.	....
11	Cedarburg Woolen Mills.	Cedarburg, Wis.	J. F. Wittenberg, Pres.	Textile.	Flooring.	....
12	City of Portland.	Portland, Ore.		Municipal.	Paving block.	53
13	City of Portland.	Portland, Ore.		Municipal.	Paving block.	53
14	J. Capps and Sons.	Jacksonville, Ill.		Textile.	Flooring.	....
15	Lyons Sugar Ref. Co.	Lyons, N. Y.	Anaheim Construct. Co.	Sugar refining.	Joist.	....
16	Lyons Sugar Ref. Co.	Lyons, N. Y.	Anaheim Construct. Co.	Sugar refining.	Joist.	....
17	Colorado Telephone Co.	Denver, Col.	F. A. Cannon, Supt. Constr.	Telephone.	Pole.	55
18	Colorado Telephone Co.	Denver, Col.	F. A. Cannon, Supt. Constr.	Telephone.	Pole.	55
19	Southern Bell Tele. Co.	Savannah, Ga.	U. S. Forest Service.	Telephone.	Pole.	67
19A	Southern Bell Tele. Co.	Savannah, Ga.	U. S. Forest Service.	Telephone.	Pole.	67
20	Carolina Lt. & Pwr. Co.	Aiken, S. C.	H. Sudlow, Mgr.	El. Lt. & Pwr.	Pole.	63
21	Federal Tel. & Tel. Co.	Buffalo, N. Y.	W. H. Lamme, Supt. Const.	T. & T.	Pole.	47
22	Federal Tel. & Tel. Co.	Buffalo, N. Y.	W. H. Lamme, Supt. Const.	T. & T.	Pole.	47
23	Denver City Tramway Co.	Denver, Col.	John Evans, Ch. Engr.	Elec. Ry.	Tie.	55
24	Denver City Tramway Co.	Denver, Col.	John Evans, Ch. Engr.	Elec. Ry.	Tie.	55
25	Utah Light & Ry. Co.	Salt Lake City, Utah	R. E. Hunt, Asst. Gen. Mgr.	Elec. Ry.	Tie.	52
26	Southern Pac. R. R. Co.	Portland, Ore.	L. R. Fields, Supt.	Railroad.	Tie.	53
27	Southern Pac. R. R. Co.	Portland, Ore.	L. R. Fields, Supt.	Railroad.	Tie.	53
28	Southern Pac. R. R. Co.	Portland, Ore.	L. R. Fields, Supt.	Railroad.	Tie.	53
29	Toledo, Peoria & Western Railway Co.	Elvaston, Ill.	J. H. Markley, Master B&B	Railroad.	Stock chute platf.	53
30	Toledo, Peoria & Western Railway Co.	Washington, Ill.	J. H. Markley, Master B&B	Railroad.	Pass. platform.	52
31	Illinois Central R. R.	Chicago, Ill.	F. G. Thompson, Eng. B&B	Railroad.	Bridge tie.	48
32	Missouri Pacific R. R.	Pueblo, Col.	C. E. Smith, Bridge Engr.	Railroad.	Stock pen post.	52
33	Missouri Pacific R. R.	Pueblo, Col.	C. E. Smith, Bridge Engr.	Railroad.	Stock pen post.	52
34	Missouri Pacific R. R.	Pueblo, Col.	C. E. Smith, Bridge Engr.	Railroad.	Stock pen post.	52
35		Fanier, Minn.	H. C. Dorhorff.	Bldg. Constr.	Shed door.	38
36	Munising Paper Co.	Munising, Mich.	L. B. Stewart, Gen. Mgr.	Paper mill.	Beater room.	40
37		Grafton, Wis.	Gustave Schroeder.	Agricultural.	Silo.	46
38		Charles City, Ia.	John Legel.	Bldg. Constr.	Walk stringer.	46
39		Swanton, Vt.	Jas. Gosselin.	Agricultural.	Gate bar.	44
40		Lowell, Mass.	J. M. Seger.	Bldg. Constr.	Porch step.	49
41		Greenville, S. C.	R. V. Hudson.	Agricultural.	Fence post.	59
42		Germania, Pa.	Christian Schumacher.	Agricultural.	Fence post.	49
43	American Thread Co.	Boston, Mass.		Textile.	Fence post.	50
44		Shumway, Ill.	Philip Bernhard.	Agricultural.	Fence post.	55
45		Drayton, N. D.	Christian Weinlaeder.	Agricultural.	Fence post.	36
46		Wilcox, Neb.	G. Amman.	Agricultural.	Fence post.	52
47		Franklin, N. H.	W. F. Daniell, Jr.	Agricultural.	Fence post.	46
48		Willard, Mo.	Robert Hartwig.	Agricultural.	Fence post.	53
49		Willard, Mo.	Robert Hartwig.	Agricultural.	Fence post.	53
50		Willard, Mo.	Robert Hartwig.	Agricultural.	Fence post.	53
51		Hamel, Ill.	Chas. Neumeyer.	Home uses.	Picket fence.	52
52		Belvue, Kans.	John Hasenbank.	Bldg. Constr.	Shingles.	55
53		Bridgeport, Conn.	Wm. Jessup, Contractor.	Bldg. Constr.	Shingles.	50
54		Drayton, N. D.	Christian Weinlaeder.	Bldg. Constr.	Shingles.	36
55	Mapledale Farm.	Deckerville, Mich.	D. Edgar Crary.	Bldg. Constr.	Shingles.	45
56	Cleveland Grove Stock Farm	Brainard, Neb.	Henry Schulz.	Bldg. Constr.	Shingles.	51
57	Long Island R. R.	Huntington, L. I.	H. B. Fullerton, Dir. Agr. Dev.	Agricultural.	Berry stakes.	51
58	Long Island R. R.	Huntington, L. I.	H. B. Fullerton, Dir. Agr. Dev.	Agricultural.	Berry stakes.	51

OF PROTEXOL CORPORATION, NEW YORK

Annual Rainfall, Inches	Service Conditions	Timber	Treatment	Years in Service	Condition on Removal	NOTES *Stated Life Untreated in Years. †Cause of Removal was by Request unless otherwise stated.
....	Steam and acid fumes	Yellow pine...	3 brush coats, hot..	10	Sound.....	Similar timbers with 3 coats white lead decayed in 18 months.
....	Steam and fumes.....	White pine....	Brush.....	10	Serviceable.....	Much of timber still perfect. *Five years. †Rebuilt
49.0	Water, atmospheric, fire.	Yellow pine....	Brush.....	14	Sound.....	Protexol used account non-inflammable character. *Three years. †Rebuilt account fire.
49.0	Water, atmospheric...	Yellow pine....	Brush.....	14	Sound.....	
33.7	Water, atmospheric..	White pine....	2 brush coats.....	22	Slight decay.....	.....
30.6	Bituminous coal mine	Tamarack.....	Open tank.....	5	Sound.....	Comparable test. *One to two years.
....	Bituminous coal mine	Tamarack.....	Untreated.....	2	Total decay.....	Comparable test. *One to two years.
51.9	Stony loam, wet.....	Yellow pine...	1 cold coat.....	20	Perfect.....	End only treated. *Five years.
....	Wet floor on sand....	Yellow pine...	2 brush coats, hot..	19	Sound.....	.....
....	Wet floor on sand....	Yellow pine...	2 brush coats, hot..	19	Sound.....	.....
....	Moist basement.....	Yellow pine...	2 brush coats.....	22	Sound.....	No ventilation.
67.5	City street.....	Oregon fir....	Open tank.....	12	Sound, 1/16" wear..	No repairs necessary.
67.5	City street.....	Oregon fir....	Open tank.....	12	Sound; 1/16" wear..	" Split to show penetration.
....	Wet, sulphuric acid...	Yellow pine...	Brush.....	9	Excellent.....	.....
....	Alternate wet and dry; high temper.	Yellow pine...	Brush.....	12	Sound.....	.....
....		Yellow pine...	Untreated.....	12	Decayed.....	.....
21.5	High ground; sandy	Eastern cedar..	2 coats, hot.....	11	.....	.....
21.5	soil	Eastern cedar..	Untreated.....	11	.....	..... not removed.
73.9	Sandy soil.....	White cedar...	2 hot coats.....	4	Sound.....	Photo by Forest Service. Specimens
73.9	Sandy soil.....	White cedar...	Untreated.....	4	Decayed.....	Comparable test. Forest Service.
65.9	Red clay.....	Black cypress..	1 brush, cold.....	11	Sound.....	Prevents woodpecker attack.
60.3	Stony loam.....	Cedar.....	Brush, hot.....	5	Perfect.....	Specimens not removed. Photo.
60.3	Stony loam.....	Cedar.....	Brush, hot.....	5	Perfect.....	by courtesy of Mr. W. H. Lamme
21.5	Sandy soil.....	Western Y. P..	15 min., hot.....	9	Perf. sound.....	.....
21.5	Sandy soil.....	Western Y. P..	Untreated.....	5	Total decay.....	.....
23.5	Open track; sandy loam	Oregon fir....	Open tank, hot....	10	Sound.....	All ties good after 10½ years. 12 gals per M. ft. B. M. *5 to 6 years.
67.5	Gravel ballast.....	Oregon fir....	15 min. in open	10	Sound.....	Under heavy traffic. Hard and well
67.5	Gravel ballast.....	Oregon fir....	tank at 180° F.	10	Sound.....	preserved after 10 years' service.
67.5	Gravel ballast.....	Oregon fir....	Untreated.....	5	Badly decayed...	Spikes hold firmly. No rail cutting. *Five years.
51.2	Weather.....	Yellow pine...	Brush.....	7	Sound.....	.....
50.4	Weather.....	Yellow pine...	Untreated.....	7	Decayed.....	Decay started at nail holes.
45.8	Over water.....	Yellow pine...	20 minutes, hot....	5	Excellent.....	From Kensington & Easton Draw Bridge. *Four to six years.
17.4	Red clay in stock pen.	L. L. Y. P....	10 min., hot.....	11	Perfect.....	4 ft. butt; treated.
17.4	Red clay in stock pen.	L. L. Y. P....	1 brush coat.....	11	Decayed.....	2 ft. at ground line treated.
17.4	Red clay in stock pen.	L. L. Y. P....	Untreated.....	11	Entirely decayed	.....
23	Weather.....	Basswood....	2 brush coats.....	12	Sound.....	.....
30.6	Steam, acid, water....	Yellow pine...	2 brush coats.....	9	Sound.....	.....
50.2	Ensilage.....	White pine...	Brush coats.....	19	Sound.....	Several coats inside only.
45.7	Sandy soil.....	White pine...	2 brush, hot.....	18	Perfectly sound..	.....
39.5	Weather.....	Spruce.....	3 brush coats	12	Absolutely sound.	.....
65.6	Weather.....	Yellow pine...	Brush.....	10	Sound.....	.....
77.8	In red clay.....	White oak....	Butt treated.....	20	Sound.....	.....
63.3	See notes.....	Chestnut.....	2 brush butt only ..	15	Sound.....	In moist, humus soil.
65.6	In sandy soil.....	Yellow pine...	Butt only.....	15	Sound.....	.....
50.4	In sandy soil.....	Oak.....	2 brush coats.....	20	Sound.....	.....
33.7	In clay soil.....	White oak....	2 coats, butt only..	15	Sound.....	.....
29.6	In clay soil.....	White pine...	2 brush coats.....	23	Very good.....	.....
52.4	Sandy soil.....	Chestnut.....	Open tank, cold...	19	Sound.....	Wet and dry soil.
58.2	In clay soil.....	White oak....	Butts, 2 brush.....	18	Good.....	*Five to six years.....
58.2	In clay soil.....	White oak....	Butts, 2 brush.....	18	Good.....	.....
58.2	In clay soil.....	White oak....	Butts, 2 brush.....	18	Good.....	.....
35.3	Weather.....	Cedar.....	1 brush coat in place	22	Perfect.....	.....
45.8	Weather.....	White cedar...	1 brush coat.....	13	Perfect.....	Nails did not rust off.....
60.5	Weather.....	Red cedar.....	1 brush coat in place	24	Perfect.....	.....
33.7	Weather.....	Cypress.....	1 brush coat.....	21	Excellent.....	.....
34.6	South roof.....	Cedar.....	1 brush coat.....	10	Perfect.....	.....
29.8	Weather.....	Cedar.....	1 brush coat	24	Perfect.....	.....
58	Sandy loam.....	Spruce.....	Brush.....	2	Perfectly sound..	.....
58	Sandy loam.....	Spruce.....	Untreated.....	2	Decayed.....	.....

Specimen No.	Company	Location	Individual and Title	Industry	Subject	Mean Temp. Deg. F.
59	J. P. Berckman Co.	Augusta, Ga.		Greenhouse	Benches	....
60	Wyomissing Nurseries	Reading, Pa.	Bertrand H. Farr, Prop.	Nursery	Tree label	51
61	Wyomissing Nurseries	Reading, Pa.	Bertrand H. Farr, Prop.	Nursery	Tree label	51
62	Wyomissing Nurseries	Reading, Pa.	Bertrand H. Farr, Prop.	Nursery	Tree label	51
63	...	Flushing, L. I.	H. D. Darlington	Greenhouse	Benches	....
64		Cuyahoga Falls. O.	M. Crawford	Agricultural	Plant labels	50
65		Cuyahoga Falls, O.	M. Crawford	Agricultural	Plant labels	50
66	Shand Builders Supply Co.	Columbia, S. C.		Bldrs. Supplies	Block	64
67	Shand Builders Supply Co.	Columbia, S. C.		Bldrs. Supplies	Block	64
68	Ruemmeli Dawley Mfg. Co.	St. Louis, Mo.		Machinery	Post	56
69	Ruemmeli Dawley Mfg. Co.	St. Louis, Mo.		Machinery	Post	56
70	U. S. Engineers	Georgetown, S. C.	W. S. Fitzsimmons, Asst. U. S. Eng.	Railroad	Freight car	67
71	U. S. Engineers	Georgetown, S. C.		Railroad	Freight car	67
72	P. & R. Coal & Iron Co.	Pottsville, Pa		Coal mining	Mine props	51
72A	P. & R. Coal & Iron Co.	Pottsville, Pa		Coal mining	Mine props	51
73	Citizens Water Works	Quincy, Ill		Water works	Reservoir	54
74	Atlantic Coast Lbr. Corp.	Georgetown, S. C.		Lumber	Idler	65
75	Atlantic Coast Lbr. Corp.	Georgetown, S. C.		Lumber	Idler	65
76		Amsterdam, N. Y.	Harry F. Bowler	Brewing	Cellar partition	....
76A		Amsterdam, N. Y.	Harry F. Bowler	Brewing	Cellar partition	....
77	Quarry Farm	Elmira, N. Y.	Susan L. Crane	Agricultural	Platform	47
78	Metropolitan Coal Co.	So. Boston, Mass.	Fred Hodgson, Ch. Eng.	Marine	Bulkhead	....
79	Metropolitan Coal Co	So. Boston, Mass.	Fred Hodgson, Ch. Eng.	Marine	Bulkhead	....
80		Conanicut Isl., R. I.	Samuel Gray, Cons. Eng.	Marine	Wharf	....
81	U. S. Lighthouse Service	Hog Island, Va.	John Murdock, Asst. Light House Engr.	Marine	Lighthouse	....
82	U. S. Lighthouse Service.	Hog Island, Va.		Marine	Lighthouse	....
83	Peace River Phosphate Mining Co.	Cleveland, Fla.	Geo. Brown, of Cleveland Marine Ry. Co.	Marine	Barge sheathing	72
84				Marine	Barge sheathing	72
85				Marine	Barge sheathing	72
86		Avondal R I	Maurice Nye	Fishing	Lobster pots	48
87		Avondale, R. I.	Maurice Nye	Fishing	Lobster pots	48
88	Munson Steamship Co.	Havana, Cuba	John Waddle, Engr.	Marine	Wharf	72
89	Munson Steamship Co.	Havana, Cuba	John Waddle, Engr.	Marine	Wharf	72
90		Albany, N. Y.	J. P. Randerson	Garage	Runway	48
91	Anheuser Busch Brew. Assn.	St. Louis, Mo.		Artificial ice	Freezing room	....
92	Birmingham Ry. Lt. & Pwr. Co.	Birmingham, Ala.	Thos. R. H. Daniel, Engr.	Elec. Ry	Pole	65
93		Birmingham, Ala	Thos. R. H. Daniel, Engr.	Elec. Ry	Pole	65
94	Porto Rico Ry. Lt. & Pwr. Co.	San Juan, Porto Rico	F. W. Teele, Gen. Mgr.	Elec. Ry.	Pole	78
95	Porto Rico Ry. Lt. & Pwr. Co.	San Juan, Porto Rico	F. W. Teele, Gen. Mgr.	Elec. Ry.	Pole	78
96		Lone Tree, Iowa	Claus Wiese	Bldg. Constr.	Shingles	50
97	Northwest Fuel Co.	Superior, Wis.	G. H. Hutchinson, Ch. Eng.	Coal	Foot block	50
98	Northwest Fuel Co.	Superior, Wis.	G. H. Hutchinson, Ch. Eng.	Coal	Foot block	50
99	Northwest Fuel Co.	Superior, Wis.	G. H. Hutchinson, Ch. Eng.	Coal	Foot block	50
100	Northwest Fuel Co.	Superior, Wis.	G. H. Hutchinson, Ch. Eng.	Coal	Batter post	50
101	Northwest Fuel Co.	Superior, Wis.	G. H. Hutchinson, Ch. Eng.	Coal	Cap	50
102	Long Island R. R. Co.	Jamaica, L. I.	C. W. Wright, Master Carp.	Railroad	Bridge tie	52
103	Long Island R. R. Co.	Jamaica, L. I.	C. W. Wright, Master Carp.	Railroad	Bridge tie	52
104	City of Niagara Falls	Niagara Falls, Ont.	H. Webber, Insp. of Sewer System.	Municipal	Sewer flume	47
105	Empire United Rys. Co.	Syracuse, N. Y.	H. C. Prather, Asst. Genl. Mgr.	Elec. Ry	Cross arm	47
106	Millville Traction Co.	Millville, N. J.	D. C. Lewis, Genl. Mgr.	Elec. Ry	Tie	53
107	Millville Traction Co.	Millville, N. J.	D. C. Lewis, Genl. Mgr.	Elec. Ry	Tie	53
108	Millville Traction Co.	Millville, N. J.	D. C. Lewis, Genl. Mgr.	Elec. Ry	Tie	53
109		Elizabeth, N. J.	E. F. Paddock	Home use	Sand box	49
110		Elizabeth, N. J.	E. F. Paddock	Home use	Sand box	49
111	D. L. & W. Coal Mng. Dept.	Scranton, Pa.	C. E. Tobey, Supt.	Coal mining	Collar	...
112	D. L. & W. Coal Mng. Dept.	Scranton, Pa.	C. E. Tobey, Supt.	Coal mining	Leg	...
113		Binghamton, N. Y.	G. W. Burbank, Architect	Bldg. Constr.	Shingles	47

PROTEXOL CORPORATION, NEW YORK—Continued

Annual Rainfall, Inches	Service Conditions	Timber	Treatment	Years in Service	Condition on Removal	NOTES *Stated Life Untreated in Years. †Cause of Removal was by Request unless otherwise stated.
....	Wet, sandy soil	Yellow pine	2 brush coats	16	Sound	Painted over with white lead. Specimen from propagating bench.
56.7	Loamy soil	Yellow pine	2 brush coats	4	Perfectly sound	Original writing legible. *One year.
56.7	Loamy soil	Yellow pine	2 brush coats	4	Perfectly sound	Original writing legible. *One year.
56.7	Loamy soil	Yellow pine	2 brush coats	4	Perfectly sound	Original writing legible. *One year
....	Rich, damp soil	Hemlock	2 brush coats	17	Excellent	
33.6	Rich soil	White pine	1 brush, cold	3	Sound	Original writing legible.
33.6	Rich soil	White pine	Untreated	1	Decayed	Markings decayed away. *½ year.
53.1	See notes	Old field pine	Cold dip	3½	Sound	Specimens in Columbia, S. C.
53.1	See notes	Old field pine	Untreated	3½	Comp. decayed	Buried in red clay; wat'r'd freq'ntly
49	Buried in sandy loam	Yellow pine	Brush	10	Sound	Specimens in St. Louis, Mo.
49	Buried in sandy loam	Yellow pine	Untreated	10	Decayed	Specimens in St. Louis, Mo
78.4	Weather	Yellow pine	1 brush, cold	4	Sound	
78.4	Weather	Yellow pine	Untreated	4	Decayed	Badly checked
49.4	Anthracite coal mine	Pitch pine	Partial brush	2	Sound	Specimens not removed. U.S. Forest
49.4	Authracite coal mine	Pitch pine	Untreated	2	Fungus growth	Service Project. Progress Photo.
53.3	Fresh water	White pine	2 brush, hot	13	Sound	For details see Engr. News 6/9/98
50.9	Weather	Gum	5 min., hot	4	Sound	
50.9	Weather	Gum	Untreated	4	Checked and split	
....	Cold storage	White pine	Brush	9	Sound	Cold storage on one side; 80 degrees
....	Cold storage	White pine	Untreated	9	Badly decayed	on other.
54.1	Weather	Hemlock	2 brush coats	10	Sound	Note penetration in small section. Color retained after 10 years.
....	Limnoria attack; salt water	Yellow pine	Brush	2	Sound	Test.
....		Yellow pine	Untreated	2	See Notes	Completely destroyed by limnoria.
....	Teredo attack; salt water	Spruce	Brush	10	Sound	*Few weeks.
....		Y. P. all heart	1 brush coat	1	Sound	Test.
....		Y. P. all heart	Untreated	1	Honeycombed by	Teredo.
70	In fresh and salt water	Yellow pine	2 brush coats	20	Sound	Supplementary treatments 1 brush
70	In fresh and salt water	Yellow pine	2 brush coats	20	Sound	coat whenever hauled out.*2 years.
70	In fresh and salt water	Yellow pine	3 brush coats	20	Sound	4 specimens from barge No. 7.
51.7	Salt water	Lath	Brush	2	Sound	*Three months.
51.7	Salt water	Lath	Untreated	4 months	Honey-combed by sea worms.	Note sound appearance of surface.
....	Teredo attack; salt water.	Yellow pine	2 brush, hot	408 days	Sound	Tested in waters next to a marine
....		Yellow pine	Untreated	408 days	Badly decayed; worm eaten.	slip. Comparable test. Specimens in Havana office.
49.3	Weather	Spruce	Brush	7	Sound	3 specimens.
....	Cold, damp air	Yellow pine	Brush	16	Sound	Note perfect condition of tar paper.
76.4	Red clay soil	Chestnut	1 br., 6 ft. butt	11	Sound	
76.4	Red clay soil	Chestnut	Untreated	11	Decayed	
64.5	San Juan-Santurce Line	Yellow pine	2 coats initial	10	Sound	†Reconstruction.
64.5		Yellow pine	2 coats supplement	10	Sound	Cross section to show penetration.
47.8	Weather	Cedar		23	Sound	
47.8	See notes	Oregon fir	Partial brush	7	Treated part sound.	From conveyor buried partly in wet earth and coal dust.
47.8	Buried in soil	Washington fir	Brush	6	Sound	From bulkhead.
47.8	Buried in soil	Washington fir	Brush	6	Sound	From bulkhead.
47.8	Weather	Washington fir	See notes	6	Sound	From trestle. Brush treated at ends.
47.8	Weather	Washington fir	Untreated	7	See notes	From sheet piling. Decay on surface.
58.6	Weather; over salt water	Yellow pine	2 brush coats	7	Sound	From Jamaica Bay Trestle.
58.6		Yellow pine	Untreated	7	Badly decayed	From Jamaica Bay Trestle.
37.9	Weather	Spruce	2 cold coats	19	Sound	Removal due to part of pipe being crushed by falling rock.
34.3	Weather	Yellow pine	Brush coated	9	Perfect	Untreated arms renewed after 5 years.
48.5	Open track	Chestnut	Open tank	8	Sound	Good for at least another 5 years.
48.5	Open track	Chestnut	Creosote tank	8	Decay begun	Infested by white ants. Badly ch'k'd.
48.5	Open track	Chestnut	Untreated	8	Decayed	Unserviceable.
52.6	Weather	Spruce	2 brush coats, hot	5	Perfect	Removal due to dismantling of box.
52.6	Weather	Spruce	Untreated	5	Decayed	Removal due to dismantling of box.
....	Anthracite mine	Pine	Open tank, hot	6½	Perfect	Comparative tests made at Bellevue
....	Anthracite mine	Pine	Untreated	2	Badly decayed	Mines in co-operation with U. S. Forest Service. Forest Products
33	Weather	Red cedar	Brush	18	Excellent	[Project No 102.

(97)

Foot block of Oregon fir supporting a timber bent under an elevated belt conveyor placed in 1906. Block was partially embedded in earth mixed with cinders and coal dust under a sill at the foot of a vertical post. During rainy weather water running down the post collected around the block. Partly treated by brush method with your material and the specimen demonstrates that where surfaces were not treated there is considerable decay to a depth of from one to two inches or more, the treated surface being perfectly sound.

(98-99)

Foot blocks of Washington fir supporting a coal bulkhead placed in February, 1907, and since that time and until their removal entirely embedded in the ground, having top six to eight inches below the surface of the ground. Specimens were brush treated and "the surfaces have the same appearance as when installed with the preservative still in evidence on the surface."

(100)

Section of rough fir with short piece bolted to it. The 8 x 8 with beveled ends was cut from an inclined batter post in a trestle bent supporting a conveyor monitor. Brush treated at stub ends and around the joints. Located with all surfaces exposed to the air and perfectly sound.

(101)

Contributed as a comparable specimen 8 x 12 rough fir and received no treatment whatever. Installed about June, 1906, as a cap on a sheet pile revetment. When removed specimen showed considerable decay where it had been in contact with timber.

All above specimens from Superior Dock No. 1, Northwest Fuel Co., Superior, Wis. Contributed by Mr. G. H. Hutchinson, Chief Engineer.

"PRESERVES WOOD EVERYWHERE"